# UMW IRF7401TR

N-Channel MOSFET

## 1.Features

- $V_{DS\ (V)}$=20V
- $I_D$=8.7A
- $R_{DS(ON)}$<22mΩ($V_{GS}$=4.5V)
- RoHS Compliant, Halogen-Free
- Compatible with Existing Surface Mount Techniques

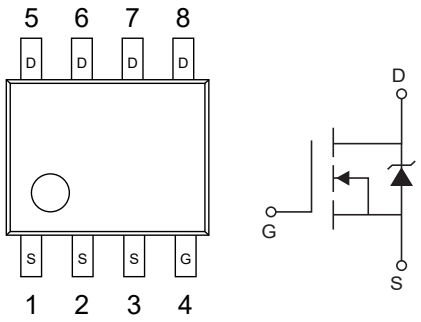
## 2.Benefits

- Multi-Vendor Compatibility
- Easier Manufacturing
- Environmentally
- Increased Reliability

## 3.Pinning information

| Pin | Symbol | Description |
|---|---|---|
| 1,2,3 | S | SOURCE |
| 4 | G | GATE |
| 5,6,7,8 | D | DRAIN |

**SOP-8**




## 4.Absolute Maximum Ratings $T_A$=25°C unless otherwise noted

| Parameter | | Symbol | Rating | Units |
|---|---|---|---|---|
| 10 Sec. Pulsed Drain Current, $V_{GS}$=4.5V | $T_A$=25°C | $I_D$ | 10 | A |
| Continuous Drain Current, $V_{GS}$=4.5V | $T_A$=25°C | | 8.7 | A |
| Continuous Drain Current, $V_{GS}$=4.5V | $T_A$=70°C | | 7 | A |
| Pulsed Drain Current ① | | $I_{DM}$ | 35 | A |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2.5 | W |
| Linear Derating Factor | | | 0.02 | W/°C |
| Gate-to-Source Voltage | | $V_{GS}$ | ±12 | V |
| Peak Diode Recovery dv/dt ② | | dv/dt | 5 | V/nS |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

## 5.Thermal Resistance Rating

| Parameter | Symbol | Typ | Max | Units |
|---|---|---|---|---|
| Maximum Junction-to-Ambient ④ | $R_{\theta JA}$ | | 62.5 | °C/W |

## 6.Electrical Characteristics $T_J$=25°C

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 20 | | | V |
| Breakdown Voltage Temp. Coefficient | $\Delta V_{(BR)DSS}/\Delta T_J$ | $I_D$=1mA,Reference to 25°C | | 0.044 | | V/°C |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=4.1A ③ | | | 22 | mΩ |
| | | $V_{GS}$=2.7V, $I_D$=3.5A ③ | | | 30 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 0.7 | | | V |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V, $I_D$=4.1A | 11 | | | S |
| Drain-to-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=16V, $V_{GS}$=0V | | | 1 | μA |
| | | $V_{DS}$=16V,$V_{GS}$=0V,$T_J$=125°C | | | 25 | |
| Gate-to-Source Forward Leakage | $I_{GSS}$ | $V_{GS}$=12V | | | 100 | nA |
| Gate-to-Source Reverse Leakage | | $V_{GS}$=-12V | | | -100 | |
| Total Gate Charge | $Q_g$ | $I_D$=4.1A | | | 48 | nC |
| Gate-to-Source Charge | $Q_{gs}$ | $V_{DS}$=16V, $V_{GS}$=4.5V | | | 5.1 | |
| Gate-to-Drain ("Miller") Charge | $Q_{gd}$ | See Fig. 6 and 12 ③ | | | 20 | |
| Turn-On Delay Time | $t_{D(on)}$ | $V_{DD}$=10V | | 13 | | ns |
| Rise Time | $t_r$ | $I_D$=4.1A | | 72 | | ns |
| Turn-Off Delay Time | $t_{D(off)}$ | $R_G$=6Ω | | 65 | | ns |
| Internal Drain inductance | $L_D$ | $R_D$=2.4Ω, See Fig. 10 ③ | | 2.5 | | ns |
| Fall Time | $t_f$ | Between lead tip | | 92 | | nH |
| Internal Source inductance | $L_S$ | and center of die contact | | 4 | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V | | 1600 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{DS}$=15V | | 690 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | $f$=1.0MHz, See Fig. | | 310 | | pF |

| Source-Drain Ratings and Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Continuous Source Current (Body Diode) | $I_S$ | MOSFET symbol showing the integral reverse p-n junction diode. | | | 3.1 | A |
| Pulsed Source Current (Body Diode) ① | $I_{SM}$ | | | | 35 | |
| Diode Forward Voltage | $V_{SD}$ | $T_J$=25°C,$I_S$=2A,$V_{GS}$=0V ③ | | | 1 | V |
| Reverse Recovery Time | $t_{rr}$ | $T_J$=25°C, $I_F$=4.1A dI/dt=100A/μs ③ | | 39 | 59 | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | | 42 | 63 | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$+$L_D$) | | | | |

Notes:

① Repetitive rating; pulse width limited by max.junction temperature.(See fig.11)

② $I_{SD}$≤ 4.1A, di/dt ≤ 100A/μS, $V_{DD}$≤ $V_{(BR)DSS}$,$T_J$≤ 150°C.

③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t ≤ 10sec.

## 7.1Typical Characterisitics

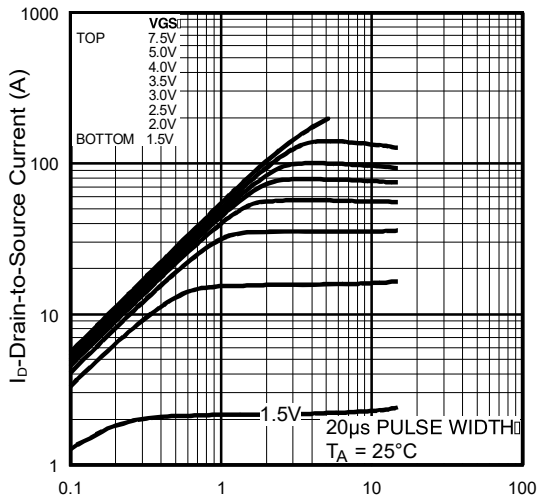



Fig 1. Typical Output Characteristics

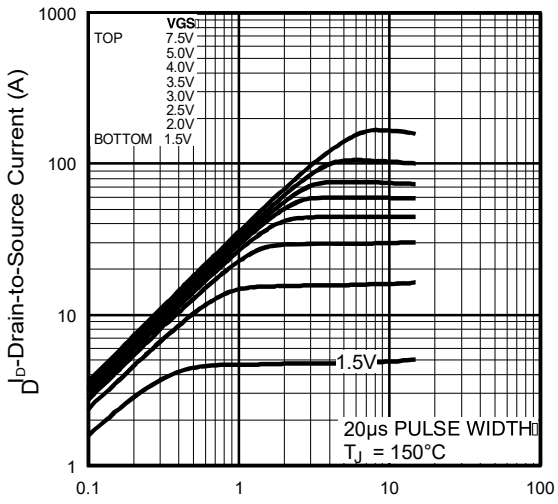



Fig 2. Typical Output Characteristics

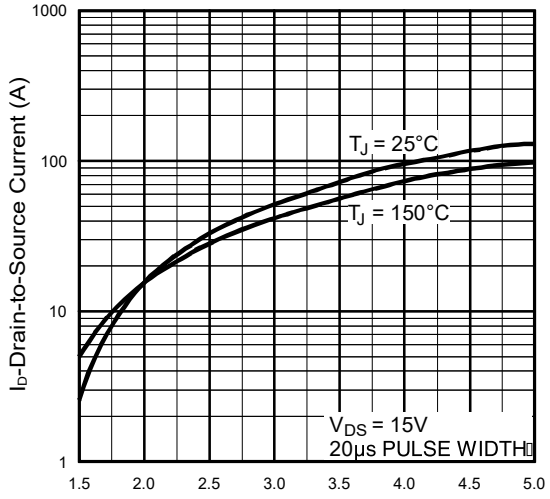



Fig 3. Typical Transfer Characteristics

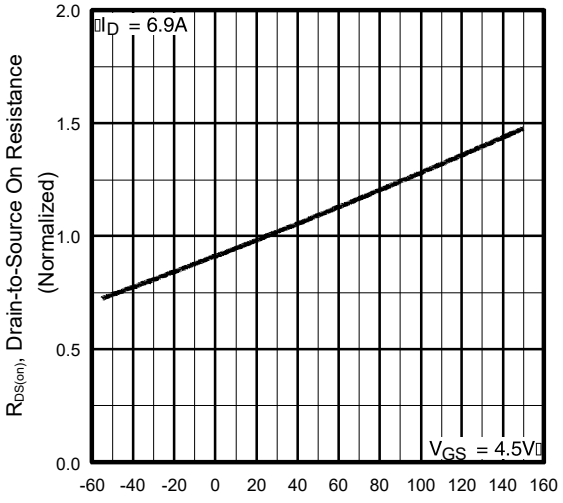
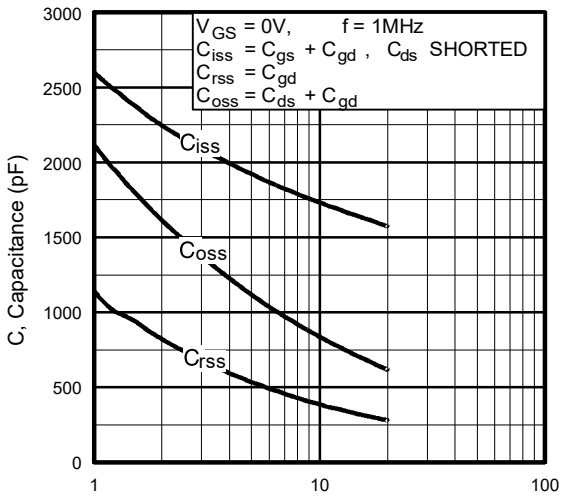


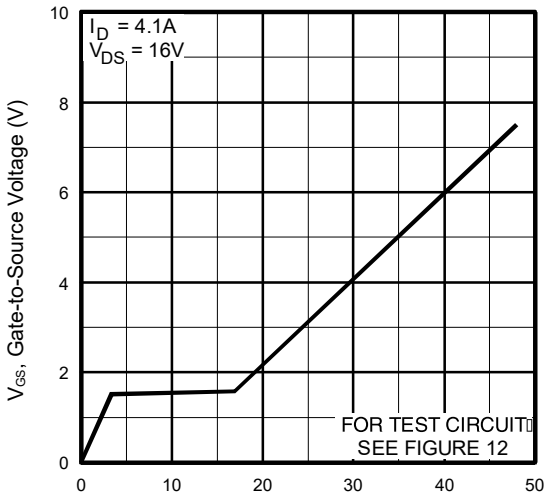

Fig 4. Nomalized On-ResistanceVs. Temperature

## 7.2Typical Characterisitics



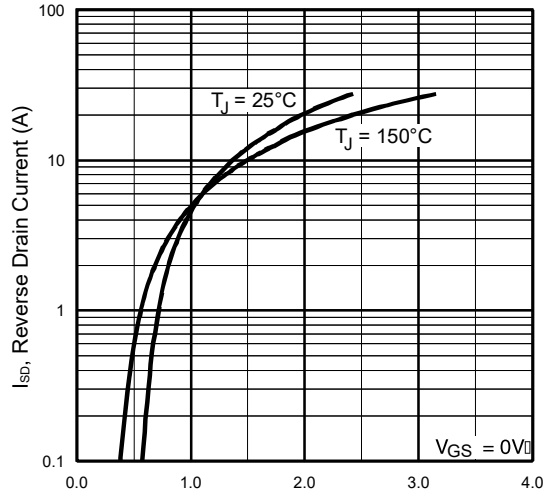

$V_{DS}$ ,Drain-to-Source Voltage (V)

Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage



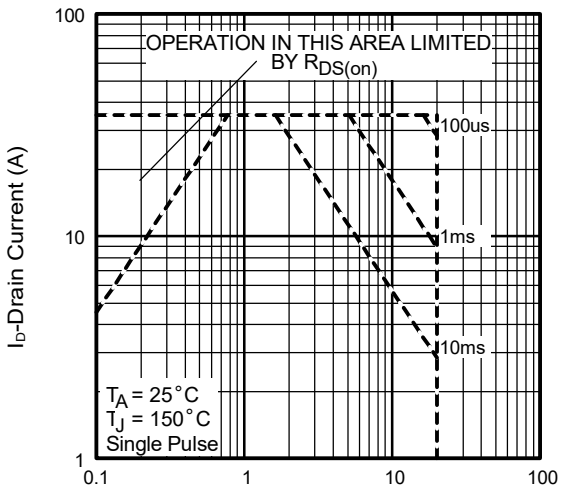

$Q_G$, Total Gate Charge (nC)

Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage




$V_{SD}$, Source-to-Drain Voltage (V)

Fig 7. Typical Source-Drain Diode Forward Voltage




$V_{DS}$, Drain-to-Source Voltage (V)

Fig 8. Maximum Safe Operating Area

## 7.3Typical Characterisitics

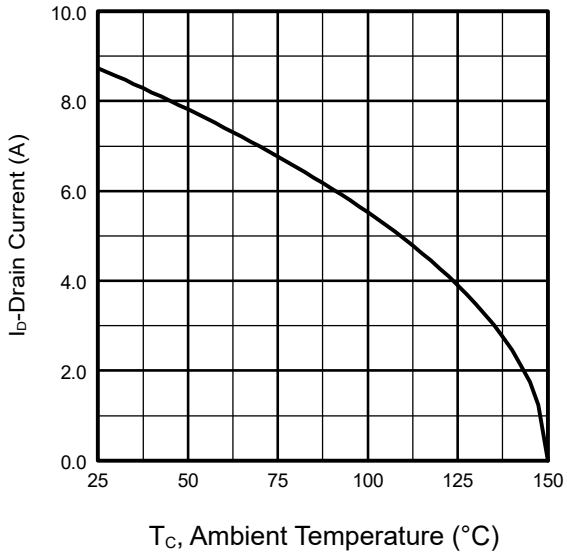



Fig 9. Maximum Drain Current Vs.AmbientTemperature

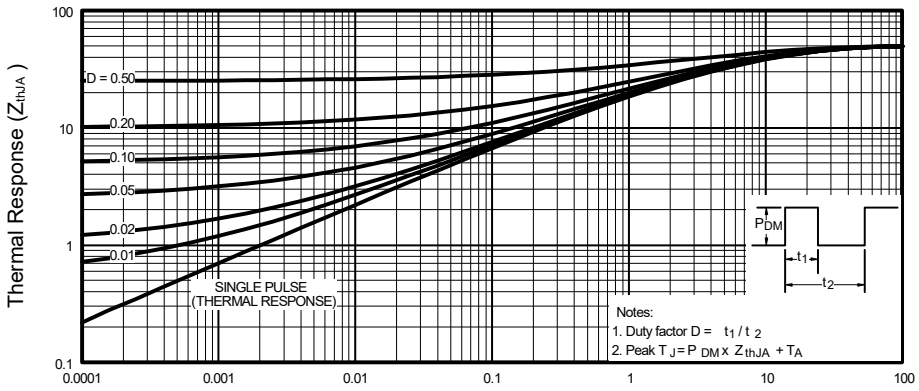



Fig 10. Maximum Effective Transient Themal Impedance, Junction-to-Ambient

## 7.4Typical Characterisitics

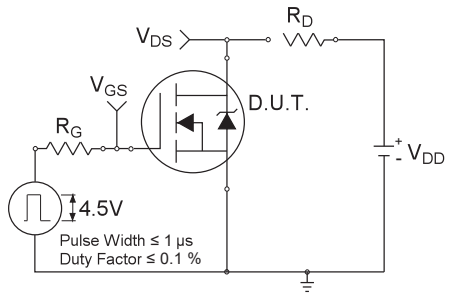



Fig 11a. Switching Time Test Circuit

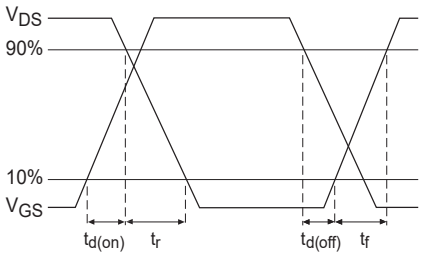



Fig 11b. Switching Time Waveforms

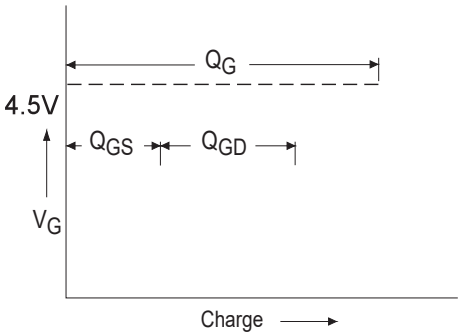



Fig 12a. Basic Gate Charge Wavefomm

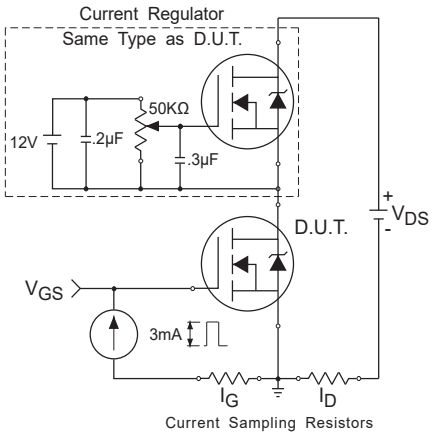
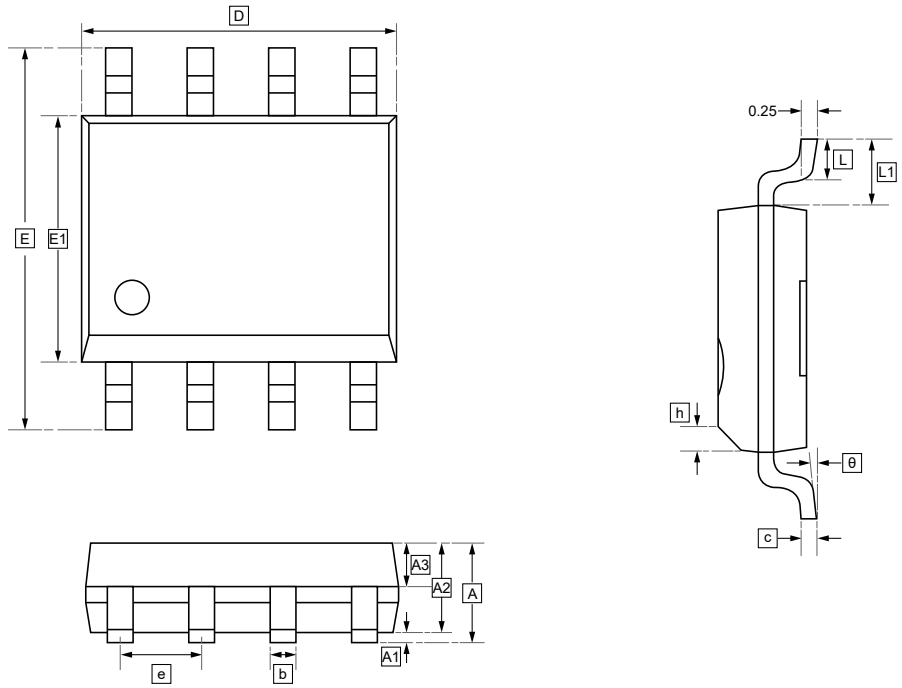



Fig 12b. Gate Charge Test Circuit

## 8.SOP-8 Package Outline Dimensions

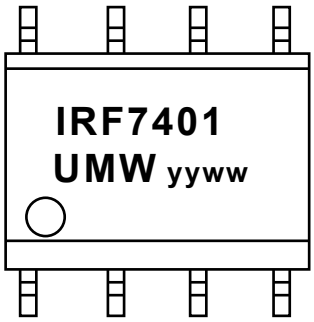



**DIMENSIONS (mm are the original dimensions)**

| Symbol | A | A1 | A2 | A3 | b | c | D | E | E1 | e | h | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Min** | - | 0.05 | 1.30 | 0.60 | 0.39 | 0.20 | 4.80 | 5.80 | 3.80 | 1.24 | 0.30 | 0.50 |
| **Max** | 1.75 | 0.20 | 1.50 | 0.70 | 0.47 | 0.24 | 5.00 | 6.20 | 4.00 | 1.30 | 0.50 | 0.80 |

| Symbol | L1 | θ |
|---|---|---|
| **Min** | 1.00 | 0° |
| **Max** | 1.10 | 8° |

## 9.Ordering information




yy: Year Code
ww: Week Code

| Order Code | Package | Base QTY | Delivery Mode |
|---|---|---|---|
| UMW IRF7401TR | SOP-8 | 3000 | Tape and reel |

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